Your search matched **25** of **685182** documents.
Results are shown **15** to a page, sorted by **publication year** in **descending** order.
You may refine your search by editing the current search expression or entering a new one the t
Then click **Search Again**.

(aloha) <and> ((cdma) or (code* <near> division* <near> multiple <near> access*)) and

Search Again

Results:
Journal or Magazine = **JNL** Conference = **CNF** Standard = **STD**

1 **A unified framework for the study of wireless packet access in the p of slow propagation impairments**
Zorzi, M.; Borgonovo, F.
Vehicular Technology, IEEE Transactions on , Volume: 49 Issue: 5 , Sept. 200
Page(s): 1547 -1557

[Abstract] [PDF Full-Text] **JNL**

2 **A fair access algorithm for packet data service in DS/CDMA-based slotted-ALOHA system**
Tae-Won Ban; Jun-Chul Lee; Sang-Min Lee; Hyub-Woo Jeon; You-Ze Cho; Ja Song
Vehicular Technology Conference Proceedings, 2000. VTC 2000-Spring Tokyo IEEE 51st , Volume: 2 , 2000
Page(s): 1160 -1164 vol.2

[Abstract] [PDF Full-Text] **CNF**

3 **Sensitivity function of soft decision carrier sense MAC protocols for CDMA networks with specified QoS**
Glisic, S.; Phan-Van, V.
Personal, Indoor and Mobile Radio Communications, 2000. PIMRC 2000. The International Symposium on , Volume: 1 , 2000
Page(s): 205 -211 vol.1

[Abstract] [PDF Full-Text] **CNF**

4 **A common control channel transmission based on contention and re for signaling and data in W-CDMA system**
Seong-Soo Park; Dong-Ho Cho; Young-Jae Song
Wireless Communications and Networking Conference, 1999. WCNC. 1999 IE
Page(s): 1363 -1367 vol.3

[Abstract] [PDF Full-Text] **CNF**

5 **Permission probability control for service fairness in CDMA slotted-systems**
Mori, K.; Kobayashi, T.
Vehicular Technology Conference, 1999. VTC 1999 - Fall. IEEE VTS 50th , Vol 1999
Page(s): 1170 -1174 vol.2

[Abstract] [PDF Full-Text] **CNF**

---

6 **Performance analysis of CDMA reservation ALOHA for multi-traffic s with adaptive access permission probability**
Kyeong Hur; Choon-Guen Cho; Kyun Hyon Tchah
TENCON 99. Proceedings of the IEEE Region 10 Conference , Volume: 1 , 199
Page(s): 502 -505 vol.1

[Abstract] [PDF Full-Text] **CNF**

---

7 **Capture and imperfect power control in spread-ALOHA systems with lognormal shadowing**
Mpako, V.M.W.; Takawira, F.
Africon, 1999 IEEE , Volume: 1 , 1999
Page(s): 245 -250 vol.1

[Abstract] [PDF Full-Text] **CNF**

---

8 **Service fairness in CDMA cellular slotted-Aloha packet systems**
Mori, K.; Kobayashi, T.; Yamazato, T.; Ogawa, A.
Global Telecommunications Conference, 1999. GLOBECOM '99 , Volume: 1b ,
Page(s): 655 -660 vol. 1b

[Abstract] [PDF Full-Text] **CNF**

---

9 **Wireless communications and a priority access protocol for multiple terminals in factory automation**
Songchar Jiang
Robotics and Automation, IEEE Transactions on , Volume: 14 Issue: 1 , Feb. 1
Page(s): 137 -143

[Abstract] [PDF Full-Text] **JNL**

---

10 **A proposal for an adaptive S-ALOHA access system for a mobile CD environment**
Sallent, O.; Agusti, R.
Vehicular Technology, IEEE Transactions on , Volume: 47 Issue: 3 , Aug. 199
Page(s): 977 -986

[Abstract] [PDF Full-Text] **JNL**

---

11 **Adaptive transmission power control in CDMA slotted-ALOHA radio communications**
Mori, K.
Universal Personal Communications, 1998. ICUPC '98. IEEE 1998 Internation Conference on , Volume: 2 , 1998
Page(s): 1137 -1141 vol.2

[Abstract] [PDF Full-Text] **CNF**

---

12 **Performance analysis for the use of adaptive beamforming in wirel packet networks**
Rashid-Farrokhi, F.; Liu, K.J.R.
Global Telecommunications Conference, 1998. GLOBECOM 1998. The Bridge Integration. IEEE , Volume: 1 , 1998
Page(s): 177 -182 vol.1

[Abstract] [PDF Full-Text] **CNF**

---

13 **C-PRMA: a centralized packet reservation multiple access for local communications**
Bianchi, G.; Borgonovo, F.; Fratta, L.; Musumeci, L.; Zorzi, M.
Vehicular Technology, IEEE Transactions on , Volume: 46 Issue: 2 , May 1997
Page(s): 422 -436

[Abstract] [PDF Full-Text] **JNL**

---

14 **A new slotted ALOHA based random access method for CDMA syste**
Esmailzadeh, R.; Gustafsson, M.
Universal Personal Communications Record, 1997. Conference Record., 1997 International Conference on , 1997
Page(s): 43 -47 vol.1

[Abstract] [PDF Full-Text] **CNF**

---

15 **Performance analysis of a fully-connected, full-duplex CDMA ALOH network with channel sensing and collision detection**
Fook Loong Lo; Tung Sang Ng; Yuk, T.T.
Selected Areas in Communications, IEEE Journal on , Volume: 14 Issue: 9 , D
Page(s): 1708 -1716

[Abstract] [PDF Full-Text] **JNL**

Welcome to IEEE Xplore

Home
Log-out

Tables of Contents

Journals & Magazines
Conference Proceedings
Standards

Search

By Author
Basic
Advanced

Member Services

Join IEEE
Establish IEEE Web Account

Your search matched **25** of **685182** documents.
Results are shown **15** to a page, sorted by **publication year** in **descending** order.
You may refine your search by editing the current search expression or entering a new one the t
Then click **Search Again**.

(aloha) <and> ((cdma) or (code* <near> division* <near> multiple <near> access*)) and

Search Again

Results:
Journal or Magazine = **JNL** Conference = **CNF** Standard = **STD**

16 **Common packet data channel (CPDC) for integrated wireless DS-C networks**
Ning Guo; Morgera, S.D.; Mermelstein, P.
Selected Areas in Communications, IEEE Journal on , Volume: 14 Issue: 4 , M
Page(s): 735 -749

[Abstract] [PDF Full-Text] **JNL**

17 **Imperfect sector antenna diversity in slotted ALOHA mobile netwo**
Linnartz, J.-P.M.G.
Communications, IEEE Transactions on , Volume: 44 Issue: 10 , Oct. 1996
Page(s): 1322 -1328

[Abstract] [PDF Full-Text] **JNL**

18 **Throughput improvement of CDMA slotted ALOHA system by modif channel load sensing protocol**
Saito, M.; Okada, H.; Sato, T.; Yamazato, T.; Katasyama, M.; Ogawa, A.
Personal, Indoor and Mobile Radio Communications, 1996. PIMRC'96., Seven International Symposium on , Volume: 1 , 1996
Page(s): 103 -107 vol.1

[Abstract] [PDF Full-Text] **CNF**

19 **Feasibility and protocol for wireless communication of multiple mo terminals in factory automation**
Songchar Jiang; Wande Wang
Industrial Electronics, Control, and Instrumentation, 1996., Proceedings of th IEEE IECON 22nd International Conference on , Volume: 2 , 1996
Page(s): 928 -933 vol.2

[Abstract] [PDF Full-Text] **CNF**

20 **Common packet data channel (CPDC) architecture for CDMA integr**

wireless access networks
Ning Guo; Morgera, S.D.; Mermelstein, P.
Personal, Indoor and Mobile Radio Communications, 1995. PIMRC'95. Wirele
Merging onto the Information Superhighway., Sixth IEEE International Symp
Volume: 1 , 1995
Page(s): 253 -258 vol.1

[Abstract] [PDF Full-Text] **CNF**

---

21 **A performance evaluation of slotted Aloha multiple access algorith fixed and variable frames for radiomobile networks**
Benelli, G.; Cau, G.R.; Radaelli, A.
Vehicular Technology, IEEE Transactions on , Volume: 43 Issue: 2 , May 1994
Page(s): 181 -193

[Abstract] [PDF Full-Text] **JNL**

---

22 **A multiple access technique for cellular packet networks with adm control**
Chih-Yuan Chang; Jen-Wei Liang; Paulraj, A.J.; Kailath, T.
Global Telecommunications Conference, 1994. GLOBECOM '94. Communicatio
Global Bridge., IEEE , Volume: 3 , 1994
Page(s): 1321 -1325 vol.3

[Abstract] [PDF Full-Text] **CNF**

---

23 **Efficiency of packet reservation multiple access**
Goodman, D.J.; Wei, S.X.
Vehicular Technology, IEEE Transactions on , Volume: 40 Issue: 1 Part: 2 , Fe
Page(s): 170 -176

[Abstract] [PDF Full-Text] **JNL**

---

24 **Distributed backlog-based control of frequency-hopped slotted ALO**
Clare, L.P.; Baker, J.E.
Military Communications Conference, 1991. MILCOM '91, Conference Record,
Communications in a Changing World., IEEE , 1991
Page(s): 402 -406 vol.2

[Abstract] [PDF Full-Text] **CNF**

---

25 **Effect of non-perfect codes on the throughput-delay performance o spectrum packet network**
Abdelmonem, A.H.; Saadawi, T.N.
Communications, 1988. ICC '88. Digital Technology - Spanning the Universe.
Conference Record., IEEE International Conference on , 1988
Page(s): 177 -183 vol.1

[Abstract] [PDF Full-Text] **CNF**

[Prev] 1 2

Home | Log-out | Journals | Conference Proceedings | Standards
Search by Author | Basic Search | Advanced Search | Join IEEE | Establish a Web Account

WEST

Freeform Search

Database:
US Patents Full-Text Database
US Pre-Grant Publication Full-Text Database
JPO Abstracts Database
EPO Abstracts Database
Derwent World Patents Index
IBM Technical Disclosure Bulletins

Term:
```
(packet near channel$) and (sync$10 near channel$)
and (frame$ near timing$) and ((cdma) or (code$
adj division adj multiple adj access$3))
```

Display: 62 **Documents in Display Format:** CIT **Starting with Number** 1

Generate: ○ Hit List ◉ Hit Count ○ Image

Search | Clear | Help | Logout | Interrupt

Main Menu | Show S Numbers | Edit S Numbers | Preferences

Search History

Today's Date: 5/15/2001

DB Name	Query	Hit Count	Set Name
USPT,JPAB,EPAB,DWPI,TDBD	(packet near channel$) and (sync$10 near channel$) and (frame$ near timing$) and ((cdma) or (code$ adj division adj multiple adj access$3))	2	L10
USPT,JPAB,EPAB,DWPI,TDBD	(packet near channel$) and (sync$10 near channel$) and (frame$ near timing$) and ((cdma) or (code$ adj division adj multiple adj access$3)) and aloha	0	L9
USPT,JPAB,EPAB,DWPI,TDBD	(packet near channel$) and (sync$10 near channel$) and (frame$ near timing$)	11	L8
USPT,JPAB,EPAB,DWPI,TDBD	l1 and l4 and l6	6	L7
USPT,JPAB,EPAB,DWPI,TDBD	(power near control$) or (power near allocat$3)	82536	L6
USPT,JPAB,EPAB,DWPI,TDBD	l1 and l4	14	L5
USPT,JPAB,EPAB,DWPI,TDBD	(base adj station$) or (base adj unit$)	56415	L4
USPT,JPAB,EPAB,DWPI,TDBD	l1 and l2	6	L3
USPT,JPAB,EPAB,DWPI,TDBD	packet near channel$	1836	L2
USPT,JPAB,EPAB,DWPI,TDBD	((cdma) or (code$ adj division adj multiple adj access$3)) same aloha	37	L1

WEST

Generate Collection

L5: Entry 11 of 14 File: USPT Dec 13, 1994

DOCUMENT-IDENTIFIER: US 5373503 A
TITLE: Group randomly addressed polling method

ABPL:
A randomly addressed polling (RAP) method for wireless networks is proposed to meet the requirements for wireless LANs which remain open to the research community. The RAP method has the following steps: When a base station is ready to conduct an up-link communication, it broadcasts a ready message to all users under its coverage; each user whenever has a packet to transmit generates a random number; all random numbers are simultaneously transmitted to the base station in response to the ready message; base station collects the random numbers, and polls the active users according to the collected random numbers; and when the base station successfully/unsuccessfully receives the packet from the user, it sends a positive/negative acknowledgment to the user.

BSPR:
The other object of the present invention is to provide a group RAP method wherein the users or mobile nodes are divided into several groups, according to their previous random numbers in successful transmissions, for respective polling. In case that a great number of users or mobile nodes join the polling contention of a base station, the group RAP method can greatly improve the RAP's stability because the number of the users in a single group is greatly reduced relative to the number of all joining users.

BSPR:
In accordance with one feature of the present invention, a randomly addressed polling method for a network having a plurality of users and base stations, each base station being capable of conducting an up-link communication and a down-link communication under its coverages with the users, and each user being capable of becoming actinic when it has a packet to transmit, the randomly addressed polling method comprises the following steps of:

BSPR:
In accordance with another feature of the present invention, the step (b) includes the step of each active user generating two random numbers respectively at two stages. The step (d) includes the steps of the base station respectively collecting the two-stage random numbers, deciding which one of the stages has the most number of distinctly collected random numbers, and polling the active users according to the random numbers at the one decided stage.

BSPR:
In accordance with further feature of the present invention, each base station includes a super-frame structure consisting of a plurality of first frames and a second frame, and each of the first and second frames polls the active users individually. Furthermore, those of the active users which had successfully sent the packets to the base station are grouped respectively into the first frames according to their previous random numbers for respective polling, and the other active users which have not successfully sent the packets to the base station are grouped into the second frame for polling.

BSPR:
In accordance with yet another feature of the present invention, the users are mobile among the coverages of the base stations. Each base station has a representing address, and the step (a) further includes the step of the base station broadcasting its representing address to all users under its coverage. Each user or mobile node is assigned a PBS location in the network to store the representing address of one of the base stations currently covering the user. When the user learns that it is under the coverage of another base station, the user sends the representing address of the another base station to its PBS

location for changing.

BSPR:
In accordance with yet another feature of the present invention, the adjacent coverages of the base stations are appropriately overlapped. When the active mobile user moves to the overlapped coverage, the active user monitors the signal strengths from the relative base stations, and selects the base station with the strongest signal strength to follow.

BSPV:
Multi-cast: According to the study of traffic in the wireless LANs, it is discovered that the down-link, i.e. from the network to the mobile nodes, traffic dominates the whole traffic in the networks. If the wireless LANs with infrastructure are taken into consideration, such a down-link traffic is likely achieved through the base stations or repeaters which broadcast the data packets to the mobile nodes. The MAC protocol must support the multi-cast function.

BSPV:
Power Consumption: Since the mobile nodes are likely to be operated by a battery power, any MAC protocol to keep the mobile nodes listening to the base station(s) all the time should be avoided in the practical applications.

BSPV:
Simple to Implement: In practical applications of the LAN environments, not only the mobile nodes but also the base stations should be able to be simply implemented. Traditional MAC (or multiple access) protocols for the wireless cellular-type networks use complicated hand-shaking procedures to complete a handoff. Within a cell which is known as the coverage of a base station, many protocols based on the token passing, carrier sensing, ALOHA have been proposed. They are, however, all facing some difficulties to be a perfect solution for the wireless LANs. At the same time, a more general MAC protocol should take both of the multiple access and handoff into consideration. Efforts have been made to develop a reasonable protocol in these years, but there is still no solution which can meet all of the MAC requirements for the wireless LANs now. The CDMA (Code Division Multiple Access) or B-CDMA (Broad-band CDMA) is hard to achieve the high-rate overlay data transmission in practical application due to the limitation of available spectrum and desirably simple base stations for the LAN applications. Therefore, how to develop a reasonable and appropriate MAC protocol for the wireless LANs is still a very important issue in this field.

BSPV:
(a) when a respective base station is ready to conduct the up-link communication, the base station broadcasting a ready message to all users under its coverage;

BSPV:
(c) all active users under the coverage of the base station simultaneously transmitting their random numbers to the base station in response to the ready message;

BSPV:
(d) the base station collecting the random numbers, and polling the active users according to the collected random numbers;

BSPV:
(e) when the base station successfully receives the packet of a respective active user, the base station sending a positive acknowledgment to the active user; and

BSPV:
(f) when the base station unsuccessfully receives the packet of a respective active user, the base station sending a negative acknowledgment to the active user.

BSPV:
(h) sending the packet to one of the base stations corresponding to the retrieved representing address; and

BSPV:
(i) the one base station broadcasting and sending the packet to the one user.

DRPR:
FIG. 2 is a schematic block diagram of a random number detection mechanism in a base station in accordance with the present invention;

DRPR:
FIGS. 11a-11c are schematic diagrams illustrating that an active mobile node moves from the coverage of a base station to the coverage of another base station through the joint cell between the two base stations, and transmits the up-link packets without a handoff, according to the RAP method of the present invention;

DEPR:
Referring now to FIG. 1, there is shown a typical wireless network, or wireless LAN, with infrastructure. The wireless LAN includes a wired high-speed backbone 10, and a plurality of base stations 12 connected to the backbone 10. Under the base station 12, several repeaters 14 may be connected thereto. The coverage of a base station 12 is known as a cell in this specification. To provide seamless data services, the adjacent cells should be adequately overlapped, and the overlapped area is known as s joint cell in this specification. Under the coverages of the base stations 12, a plurality of mobile nodes or users 16 may exist. Hereinafter, the applicant will utilize the wireless LAN to describe a randomly addressed polling (RAP) method according to one preferred embodiment of the present invention. However, it should be understood that the RAP method can be easily generalized to all kinds of networks and personal communication services through wired and/or wireless medium. For example, the present invention can also be applied to the wireless networks with multiple-cell coverage (including microcell and picocell structures), personal communication networks or personal communication services through wireless medium, as well as data networks and integrated service networks through wired and/or wireless medium.

DEPR:
Since the MAC of wireless LAN has to serve the mobile nodes 16 which perhaps move across the cell boundaries, the handoff initiated by a centralized scheme will make the system implementation very complicated. Also, the dynamic nature of the wireless transmission and network makes the decentralized protocol hard to work reliably. Therefore, the present invention proposes a centralized MAC protocol with partial decentralized functions, such as the initiation of a handoff. Such a MAC protocol is named as a randomly addressed polling (RAP) method. Since the down-link, i.e. from the base station 12 or repeater 14 to the mobile nodes 16, transmission is obviously achieved by broadcasting, the RAP method is primary aiming at the up-link traffic, i.e. from the mobile nodes 16 to the base station 12 or repeater 14. The whole RAP method of the present invention will be described in detail later.

DEPR:
The fundamental idea of the RAP method is that the base stations 12 only poll those active mobile nodes 16, i.e. the mobile nodes with packets ready to transmit, under their own coverages. Only the active mobile nodes 16 will be polled since there is no guarantee that polling all mobile nodes in the coverage of a base station can work (this could refer to the inventor's article "On the Design of Medium Access Control Protocol for High Speed Wireless LANs"). Actually, the, reason is simple. Due to the dynamic wireless channel characteristics and network topology, the IEEE 802.11 requires that previous transmission does not imply successful transmission next time even without error caused by noise. The collection of the mobile nodes under the coverage of any specific base station is not completely known by the base station. The RAP protocol only intends to identify those active mobile nodes and polls those nodes. The RAP method can be carried out by the following procedure.

DEPR:
One example is described here to facilitate the understanding of the RAP method. Suppose there are eight mobile nodes A, B, C, D, E, F, G, and H under the coverage of a base station. We choose p=5 and thus form a Galois Field GF(5)={0, 1, 2, 3, 4}. At the beginning of the polling cycle, only five mobile nodes A, D, E, G, and H are the active nodes with packets to transmit. Let L=2. When the ready message [READY] is received, all active mobile nodes A, D, E, G, and H generate and transmit, for example, the following random numbers at two stages (step 2).

DEPR:

For the base station, it collects three random numbers 1, 2, and 3 at the first stage and four random numbers 0, 1, 3, and 4 at the second stage if the transmission of distinct numbers can be done orthogonally (step 3).

DEPR:
The base station collects the most distinct numbers (or addresses), i.e. four, at the second stage. Thus, the base station broadcasts that it will poll the mobile nodes according to the second random numbers in order of 0, 1, 3, and 4. When the base station polls "0", the mobile node A sends its packet. With error-free transmission, the node A will get a positive acknowledgment [PACK] from the base station. So will the nodes D and G. However, when the base station polls "1", the packets from the nodes E and H collide. Not considering the capture effect, the nodes E and H will receive a negative acknowledgment [NACK], and go to re-polling procedure (steps 4 and 5). Of course, with the consideration of channel errors, the nodes A, D, and G may get the negative acknowledgment [NACK] either, and join the re-polling.

DEPR:
The success of this protocol relies heavily on whether the active mobile nodes 16 can apply an appropriate orthogonal signaling to transmit the random numbers (addresses) to the base station 12. Since the present invention intends to apply this MAC protocol for different transmission methods such as the direct sequence spread spectrum, frequency hopped spread spectrum, narrow-band RF, and infrared with direct detect modulation, and so on, it is necessary to propose a practical signaling and detection mechanism for different transmissions. A practical random number (address) detection mechanism is shown in FIG. 2. As shown in FIG. 2, there are shown four non-active mobile nodes 16 represented by a circle symbol, and three active mobile nodes 16' represented by a square symbol under the coverage of a base station. The detection mechanism of the base station includes p random number detectors 20 connected in parallel. The random number detectors 20 are connected between ark antenna 24 and control logics 22. The next problem is to find the proper signaling. The signaling scheme requires:

DEPR:
The RAP protocol of the present invention can be evaluated on the basis of the Poisson traffic assumption. Within a unit time, i.e. the packet transmission time in this specification, a mobile node has packets to transmit followed by a Poisson distribution with intensity .lambda.. We define the throughput .eta. to be: ##EQU2## where .sigma..sub.succ is the time duration for successful transmission; .sigma..sub.coll is the time duration for collisions; .sigma..sub.overhead is the time duration for polling and detection overhead; .sigma..sub.idle is the time duration of no packet transmitted to the network. We also define the time delay D to be the time duration from a mobile node becoming active to its packet being successfully transmitted, and the overhead to be the total time resulting from the transmission and detection of the random numbers, polling overhead, propagation delay, etc. in the unit of packet transmmission time. FIGS. 3 to 10 demonstrate the computer simulations of the RAP protocol with ten mobile nodes in a cell, i.e. the coverage of a base station. These Figures show that:

DEPR:
As shown in FIG. 1, the mobile nodes 16 are possibly in the joint cell region, that is, under the coverages of two or more base stations 12. This situation actually demonstrates the advantage of the RAP protocol of the present invention. When the mobile node 16 becomes active, it only has to listen to the ready message broadcasting [READY]s from the base stations 12. The mobile node 16 can pick up the clearest base station and follow its instructions to be polled. The handoff becomes transparent in this situation for the RAP protocol. In case that a mobile node moves across the joint cell or cell boundary, the RAP protocol allows this mobile node to transmit its up-link packets without handoff, and this is a novel improvement on the MAC protocol for the cellular-type wireless networks. FIGS. 11a to 11c illustrate the no up-link handoff of the RAP method. In FIG. 11a, an active mobile node A is only under the coverage of a base station 30, and is moving along the direction shown by an arrow X. In this situation, the mobile node A sends the packet to the base station 30. In FIG. 11b, the mobile node A has moved to the joint cell between the base stations 30 and 32. In this situation, the moving mobile node A can join the polling of the base station 30 or 32 according to its own choice, for example according to the signal strengths from the base stations 30 and 32. In FIG. 11c, the mobile node A is only under

the coverage of the base station 32, and thus sends the packet to the base station 32.

DEPR:
Up to this point, the present invention only considers the RAP protocol in the up-link situations except the broadcasting for the down-link. However, under the multiple-cell operation, the down-link transmissions can not be fully successful via simple broadcasting because the mobile nodes may move to other cells or stay in the joint cell. The present invention has to further modify the RAP protocol for the down-link, i.e. from the base station 12 to the mobile nodes 16 as shown in FIG. 1, as follows:

DEPR:
To support, the multi-cast function of the RAP protocol, such kind of packets will be broadcasted multiple times to ensure the successful reception, under channel error(s), of the positive acknowledgments [PACK]s from all destinated nodes. It should be understood that adequate control of the polling timing at the base stations, such as (colored) token passing, can make the RAP method work smoother.

DEPR:
Referring to FIGS. 12a and 12b, the GRAP adopts a super-frame structure consisting of p+1 frames (from Group 0 to Group p). In each frame, the first part is dedicated to the base station's broadcasting. It should be noted that each broadcasting must consist of multiple identical transmissions to ensure the precise reception for multi-casting. After the base station ensures the correct reception of broadcasting, the end-of-broadcasting [EOB] is broadcast, and the active mobile nodes under its coverage know that the polling cycle begins and proceeds as previous descriptions. However, in the GRAP protocol, not all active mobile nodes contend in one polling contention period. Those old nodes which had sent transmission(s) successfully to this base station before this cycle are arranged into the Group 0 to Group p-1 respectively according to their previous successful random numbers (or addresses). All new joining nodes are arranged into the pth group. Only the mobile nodes in the same group contend with each other individually. In this way, the number of the active mobile nodes joining one polling contention will be significantly reduced, so that the RAP's stability can be highly improved, even in the situation that a great number of active mobile nodes exist under the coverage of a base station.

DEPR:
The GRAP has an advantage to support both of the "priority traffic" and "no-priority traffic". In order to support the "priority traffic", such as those in the integrated services or multi-media, the protocol of the present invention can limit the mobile nodes with lower traffic priority to only generate part of the random numbers, for example in the set I.sub.R ={0, 1, . . . , p-1}. Furthermore, since the random numbers are actually generated by the mobile nodes themselves, the fairness of access in the present invention is for sure. Additionally, in case that the receptions of two active nodes at a base station differ quite a lot, and even worse that the stronger one keeps transmission for a series of packets, the GRAP can also resolve this situation because there is a large probability that the node with stronger transmission will change to another group according to its newest successful random number quickly. Thus, the fairness of access is further guaranteed.

DEPR:
Two examples are described here to illustrate how the GRAP method works. In the first example, suppose ten active mobile nodes A, B, C, D, E, F, G, I, K, and L are under the coverage of a base station, and p=5. The nodes A, C, D, F, G, I, and L had sent successful transmissions at this base station, and their previous random numbers are 2, 3, 0, 2, 1, 4, and 3 respectively. The nodes B, E, and K do not send a successful transmission at this base station before. After the broadcasting period, the node D is in the group "0", the node G is in the group "1", the nodes A and F are in the group "2" for contention , the nodes C and L are in the group "3" for contention, the node I is in the group "4", and the nodes B, E, and K are in the group "5" for contention.

DEPR:
In the second example, suppose ten mobile nodes A, B, C, D, E, F, G, I, K, and L are under the coverage of a base station, and p=5. At the beginning of a

superframe, the nodes A, C, E, and K have the data packets to transmit, and their previous random numbers are 2, 3, 0, and 2, respectively. The node F has a timebounded packet to transmit. After the broadcasting period, the nodes E and F are in the group "0" for contention and polling. No node is active for group "1". Then, the node L has a time-bounded service packet to transmit and an active mobile node X becomes under the coverage of the base station. The nodes A, K, and L are in the group "2" now. The node L's time-bounded service packet may not go through after the first trial (or first a few trials). The node L may defer to the next group in order to let other packets easier to go through. Then, the nodes C and L are in the group "3". Finally, the node X is in the group "5".

DEPV:
1. When a base station 12 is ready to collect up-link packets, it broadcasts a ready message, for example [READY], to all mobile nodes 16 under its coverage. Alternatively, the ready message may be only a special end-of-file message from the previous (broadcasting) transmission. It should be noted that the base station 12 may not know its coverage and thus covered mobile nodes 16. This is a realistic situation for the wireless LANe due to the fast changing environments.

DEPV:
2c. In general, the mobile nodes 16 may transmit the random numbers q times at each stage. The base station 12 may use a majority-vote policy to decide the correctly transmitted random number(s). With error-free transmission assumed this specification, q=1 is enough. In case that the base station 12 can not recognize certain random number(s), it will assume no reception.

DEPV:
3. The base station 12 listens to all random numbers or addresses at each stage simultaneously. Suppose there are N active mobile nodes 16 . At the 1th (1.ltoreq.l.ltoreq.L) stage, there are N random numbers represented by certain way which the base station 12 can recognize. Let these N random numbers be r.sub.l.sup.1, . . . , r.sub.l.sup.N which is perhaps not distinct at the 1th stage. If there is no random number from the mobile nodes 16, this polling cycle is stopped.

DEPV:
4. If at the l*th stage, there exists the most number of distinct random numbers which are R.sub.1 < . . . base station 12 broadcasts that it will poll according to the l*th random numbers of the mobile nodes 16. When the base station 12 polls the mobile nodes which had sent the random number R.sub.r (1.ltoreq.r.ltoreq.N*) at the l*th stage, the mobile node(s) transmits the packet(s) to the base station 12. Collision will occur when two or more mobile nodes send the same random number. If N=N*, no collision exists.

DEPV:
5. When the base station 12 successfully/unsuccessfully receives the packet from the mobile node 16, it sends a positive/negative acknowledgment, for example [PACK]/[NACK], right away before polling next one or at the end of polling all current active nodes. If the mobile node receives [PACK], it removes the packet from its buffer. Otherwise, the mobile node(s) keep the packet(s) for further polling. After all scheduled transmissions are completed, the base station 12 re-polls again, i.e. repeats the above steps 1-4. Although the re-polling polling may allow new active mobile nodes to join, we assume that no new active mobile node is allowed to join re-polling.

DEPV:
1. When any mobile node registers in the wireless network, a PBS (Permanent Base Station) location in the network is assigned to store the representing address of a CBS (Current Base Station) now covering this specific mobile node. This PBS may be the central switch for the cellular networks.

DEPV:
2a. When a base station polls the mobile nodes, it can identify itself by use of the representing

address at the same time. If a mobile node learns that it is under the coverage of a new base station, it sends a message regarding the address of its new CBS to the PBS location for changing. For a wireless LAN, the mobile nodes are possible to learn the change of the coverage only when it becomes active. Thus, the mobile nodes do not have to monitor the base stations all the time and thus this manner can save power. However, if the mobile nodes require certain time-bounded services from the wireless networks such as voice in a cellular telephone network, the following step 2b is suggested to conduct a soft handoff.

DEPV:
2b. Under the time-bounded services, the mobile nodes in the joint cells have to monitor the signal strengths from the possible base stations. A two-level handoff is suggested here. Let .delta..sub.n be the signal strength of a potentially new CBS for a mobile node in the joint cell, and .delta..sub.c be the signal strength of the CBS. It is defined that .delta.=.delta..sub.n -.delta..sub.c. If .delta.>.alpha..sub.-, the mobile node is ready to handoff. When .delta.>.alpha..sub.+, the mobile node makes a soft handoff.

CLPR:
1. A randomly addressed polling method for a network having a plurality of users and base stations, each base station being capable of conducting an up-link communication and a down-link communication under its coverages with said users, and each user being capable of becoming active when it has a packet to transmit, said randomly addressed polling method comprising the following steps of:

CLPR:
2. A randomly addressed polling method as claimed in claim 1, wherein the step (b) includes the step of each active user generating two random numbers respectively at two stages; and wherein the step (d) includes the steps of said base station respectively collecting said two-stage random numbers, deciding which one of said stages has the most. number of distinctly collected random numbers, and polling said active users according to said random numbers at said one decided stage.

CLPR:
3. A randomly addressed polling method as claimed in claim 2, wherein each base station includes a super-frame structure consisting of a plurality of first frames and a second frame, and each of said first and second frames polls said active users individually; and wherein those of said active users which had successfully sent the packets to said base station are grouped respectively into said first frames according to their previous random numbers for respective polling, and the other active users which have not successfully sent the packets to said base station are grouped into said second frame for polling.

CLPR:
4. A randomly addressed polling method as claimed in claim 3, wherein each user is mobile among the coverages of said base stations.

CLPR:
5. A randomly addressed polling method as claimed in claim 4, wherein each base station has a representing address, and the step (a) further includes the step of said base station broadcasting its representing address to all users under its coverage; and wherein each user is assigned a PBS location in said network to store the representing address of one of said base stations currently covering said user, and when said user learns that it is under the coverage of another base station,

said user sends the representing address of said another base station to its PBS location for changing.

CLPR:
7. A randomly addressed polling method as claimed in claim 6, wherein the adjacent coverages of said base stations are appropriately overlapped; and wherein when said active mobile user moves to the overlapped coverage, said active user monitors the signal strengths from the relative base stations, and selects the strongest signal strength to follow.

CLPR:
8. A randomly addressed polling method as claimed in claim 7, wherein said ready message is an end-of-file message of a previous transmission of said base station.

CLPR:
15. A randomly addressed polling method as claimed in claim 7, wherein each random number is transmitted several times; and wherein said base station utilizes a majority-vote policy to decide the correctly transmitted random numbers.

CLPR:
16. A randomly addressed polling method as claimed in claim 7, wherein each base station includes a plurality of random number detectors to collect said random numbers.

CLPR:
22. A randomly addressed polling method as claimed in claim 6, wherein the step (i) includes the step of said one base station broadcasting the packet several times to support a multi-cast function of said randomly addressed polling method.

CLPV:
(a) when a respective base station is ready to conduct said up-link communication, said base station broadcasting a ready message to all users under its coverage;

CLPV:
(c) all active users under the coverage of said base station simultaneously transmitting their random numbers to said base station in response to said ready message;

CLPV:
(d) said base station collecting said random numbers, and polling said active users according to said collected random numbers;

CLPV:
(e) when said base station successfully receives the packet of a respective active user, said base station sending a positive acknowledgment to said active user; and

CLPV:
(f) when said base station unsuccessfully receives the packet of a respective active user, said base station sending a negative acknowledgment to said active user.

CLPV:
(h) sending the packet to one of said base stations corresponding to said retrieved representing address; and

CLPV:
(i) said one base station broadcasting and sending the packet to said one user.

WEST

Generate Collection

L7: Entry 3 of 6 File: USPT Jan 4, 2000

DOCUMENT-IDENTIFIER: US 6011788 A
TITLE: S-CDMA fixed wireless loop system employing subscriber unit/radio base unit super-frame alignment

BSPR:
This invention relates generally to wireless local loop systems and, in particular, a fixed wireless loop system providing voice and data communications between a radio base unit and a plurality of subscriber stations.

DRPR:
FIG. 1 is a simplified block diagram of a synchronous, DS-CDMA fixed wireless communications system in accordance with this invention, the system having a radio base unit (RBU) and a plurality of transceiver or subscriber units (SUs). The RBU transmits a side channel to the SUs, and also receives an essentially asynchronously transmitted side channel from the SUs.

DEPR:
The FWS 10 is a synchronous CDMA (S-CDMA) communications system wherein forward link (FL) transmissions from a radio base unit (RBU) 12 for a plurality of transceiver units, referred to herein as user or subscriber units (SUs) 14, are symbol and chip aligned in time, and wherein the SUs 14 operate to receive the FL transmissions and to synchronize to one of the transmissions. Each SU 14 also transmits a signal on a reverse link (RL) to RBU 12 in order to synchronize the timing of its transmissions to the RBU 12, and to generally perform bidirectional communications. The FWS 10 is suitable for use in implementing a telecommunications system that conveys voice and/or data between the RBU 12 and the SUs 14.

DEPR:
Radio emissions lose energy as they travel in air over long distances. In order to ensure that the received signal energy from a distant subscriber is not completely overwhelmed by that of a near subscriber, the RBU 12 controls the power level of the SUs 14. In the preferred embodiment only the reverse channel power (from SU 14 to the RBU 12) is controlled by the RBU 12. The power control is primarily established at SU 14 initialization.

DEPR:
Subsequent power adjustments are infrequent and are made in response to transient environmental conditions. The closed loop power control is implemented by comparing against a desired power level and making incremental adjustments until the desired level is achieved.

DEPR:
The forward channel power control is not needed since each SU 14 receives its entire signal at only one level. The RBU 12 merely needs to ensure that the received signal strength by the farthest SU 14 is sufficient for its application.

DEPR:
At this point, super-frame aligned S-CDMA communications have been established between the RBU 12 and the SU 14, which enables the SU 14 to begin and end its transmissions at super-frame boundaries that are associated with the timing of the E1 trunks at the E1 Interface 20. Communications between the RBU 12 and SU 14 can then be switched from the asynchronous side channel to a synchronous channel using an assigned PN spreading code. In the presently preferred embodiment the SU 14 is first assigned to an unused traffic channel and communications between the RBU 12 and the SU 14 is tested. Assuming that the test is passed, the traffic channel PN code is relinquished by the SU 14, which then begins monitoring a forward synchronous channel to detect incoming messages, such as pages, from the

RBU 12. At this juncture a voice or data transmission is ready to be performed. When a call is to be made, the SU 14 makes a request on one of the plurality of reverse synchronous side channels using the Slotted Aloha technique, as described in further detail below.

DEPR:
This same entire process is repeated for each SU 14 brought on-line in the system. After being brought on-line, the SU 14 will store the correct timing and power control information in a non-volatile memory in the event that the SU 14 later loses synchronization with the forward link.

CLPR:
13. A method for operating a synchronous Code Division Multiple Access (S-CDMA) radio frequency communication system having a radio base unit (RBU) and a plurality of subscriber units (SUs), comprising steps of:

WEST

Generate Collection

L3: Entry 3 of 6 File: USPT Aug 22, 2000

DOCUMENT-IDENTIFIER: US 6108317 A
TITLE: Cyclic code phase multiple access for inbound satellite communications

BSPR:
MAI occurs because of the autocorrelation sidelobes. The MAI is compounded since the users are not bit synchronous. In particular, the sidelobe levels of the autocorrelation function do not completely describe the MAI with this technique. The actual sidelobe level in the transmitted signal also depends on the user's bit patterns. Referring to FIG. 2, one bit duration from user 1 will generally overlap with two bits of any other user. For example, a first bit (not shown) for user k (114) ends at a time 117 and a new bit 119 begins, such that a latter portion of the first bit and the beginning portion of the new bit 119 for user k overlaps bit 113 of user 1 (112). So when another user incurs a bit transition, the sidelobe levels increase, causing interference for user 1. Consequently, the code sequence chosen in this approach must have sufficient length to mitigate a moderate level of MAI. In contrast to synchronous CDMA, spread slotted ALOHA will not be able to support N active users with an N length code sequence.

DEPR:
Referring to FIG. 6, synchronization estimates are processed on 20 msec intervals, such as interval 382, (96 bits at 4800 bps) sequentially starting with control/synchronization interval 382 and voice channel 1 (384), then processing, control/synchronization slot 386, then processing voice channel 2 (388), then again processing control/synchronization slot 390, and so forth, finishing with voice channel 30 (392). In this embodiment, this process takes 1.2 seconds with a total of 60 estimates formed. Note also that, in this embodiment, with 500 VSATs assigned to a channel group, each VSAT has an opportunity to updates its synchronization every 500.times.2.times.0.02=20 seconds. All 60 estimates are then combined into a single synchronization control packet (on channel 174, FIG. 4a) and broadcast to the VSATs in the outbound control/synchronization slot.

DEPR:
The bit timing recovered TDM clock recovered by a clock recovery block 440 is used as the timing reference for the VSAT 194 and provides the reference to a transmit chip clock generator 442. In the preferred embodiment, this clock is 32 times the TDM outbound rate, or approximately 4.8 MHz. This reference clock is divided by 16 in the chip rate clock generator 442 to form a transmit PN clock 444. This clock generator 442, in turn, drives the PN code generator 446 used to spread the inbound transmissions. Channel assignments from the hub 140 include a PN code 448 (one of 31) to be used for inbound voice channel transmission. This information is recovered from the outbound control packets on channel 418 by a VSAT Control process 450 wherein the assigned code number 448 is used to configure the PN code generator 446. Time adjustments on line 451 are commanded of the VSAT 194 through the control channel 418. These adjustments are used to maintain bit synchronous operation between the VSATs on the inbound channel. These commands on line 451 are used to adjust the timing phase of the chip rate clock at generator 442. By operating at 16 times chip rate, timing errors of .ltoreq.1/32 of a chip can be maintained.

DEPR:
The presently preferred embodiment of the invention utilizes a technique which achieves the superior performance of bit synchronous CDMA while benefiting from a low complexity implementation. With this technique, bit synchronous users are assigned separate and distinct code sequences for the spreading of information bits. The code sequences are obtained by cyclically shifting, by one chip time, a single code sequence, called the mother sequence 404, which possesses low autocorrelation sidelobes. Therefore, this technique for multiple access is referred to as Cyclic Code Phase Multiple Access (CCPMA). FIG. 8 illustrates the bit synchronous relationship 602 of the spreading sequence, e.g., 604, 606, of

different users, e.g., 608, 610, respectively, obtained by cyclic shifts of the mother sequence 604. It is evident from this figure that each user's information bit, e.g., 612, is spread with a distinct code. Since an N length sequence can support up to N users, the problem of finding a large set of good codes in order to support large networks has been eliminated. Referring to FIG. 8, since the users are bit synchronous, MAI depends only on the sidelobes of the cyclic autocorrelation function of the mother code sequence. It does not depend on the sequence of transmitted bits as used with spread slotted ALOHA. Further, if the mother code sequence has uniform sidelobe levels then the average MAI will be zero. Hence the preferred mother code sequence used in generating the set of user code sequences is the maximal length sequence (MLS). Since the MAI level for CCPMA is lower than for spread slotted ALOHA, the bandwidth requirements for a specified level of throughput are lower for CCPMA. In fact, much

DEPR:
like synchronous CDMA, CCPMA can simultaneously support N active users. As noted, spread slotted ALOHA cannot support N active users without increasing the bandwidth.

DEPR:
Like synchronous CDMA, a direct implementation of CCPMA would require a separate correlation receiver for each user. At a hub or gateway, a significant cost penalty is incurred if implemented in this manner. A reduced complexity implementation is identified herein which exploits the inherent relationship between the codes. This relationship is that each code is a chip-time, cyclic shift of another code. Due to this cyclic relationship, a linear correlator receiver like the one needed for spread slotted ALOHA cannot properly despread each user's signal. What is required is a cyclic correlation receiver.

DEPR:
For typical values of N, the hub complexity is substantially lower than synchronous CDMA. For example with N=31, spread slotted ALOHA requires one linear correlator, CCPMA requires a double length cyclic correlator and synchronous CDMA requires 31 correlators. Consequently, CCPMA is only slightly more complex than spread slotted ALOHA but has significantly lower levels of MAI. As compared to synchronous CDMA, the MAI levels are comparable but the complexity associated with CCPMA is dramatically reduced.

WEST

Generate Collection

L5: Entry 3 of 14 File: USPT Oct 31, 2000

DOCUMENT-IDENTIFIER: US 6141337 A
TITLE: Spread spectrum communication system

ABPL:
Before transmitting an upward traffic packet of a long code, a mobile terminal sends a short packet including a short code to a reservation channel. A base station measures delay of each packet by an initial acquisition circuit to establish chip synchronization timing and a packet de-multiplexer to separate from each other packets overlapped in time with each other. When spreading the long-code packet transmitted via a traffic channel from the mobile terminal, information of the measured delay time is synchronously despread by setting a coefficient at an appropriate point of timing to a matched filter.

BSPR:
A high-speed synchronizing method in a reverse line of a CDMA packet communication system has been described in pages 67 to 74 of an article entitled "A Demodulation for Direct-Sequence Spread ALOHA System", Technical Report of the Institute of Electronics, Information and Communication Engineers (IEICE), A P95-10 (1995-04).

BSPR:
FIG. 17 shows a conventional tranceiver section in a block diagram. In a mobile terminal, transmission data is multiplied by a spreading code generated from a PN generator 80. The obtained data is transmitted via a high-frequency circuit 404 from an antenna 400a. The spreading code generated from the PN generator 80 is equal to one symbol and such a code will be called "short code" herebelow. A receiver section of a base station receives a signal from the mobile terminal. The signal received by an antenna 400b is delivered via a high-frequency circuit 403 to be subjected to a correlation process in a matched filter 601. To extract received data from a signal outputted from the matched filter, an initial acquisition circuit 603 detects a preamble 202 of a packet, which will be described later, and then produces a synchronizing signal. Using the synchronizing signal produced from the initial acquisition circuit 603 as a reference signal, a packet de-multiplexer 605 samples the signal from the filter 601 at a symbol period or for each symbol to produce an associated value. The signal outputted from the de-multiplexer 605 is demodulated by a detector circuit 607.

BSPR:
In a CDMA communication system according to the present invention, the radio channel between a base station and a mobile terminal includes a plurality of traffic channels to transmit an upward or reverse link data packet (from the mobile terminal to the base station) and a downward or forward link data packet (from the base station to the mobile terminal), a reservation channel to transmit a reservation packet indicating a request for allocation of a traffic channel from the mobile terminal to the base station, and a reply channel to transmit a reply packet indicating a traffic channel for data communication from the base station to the mobile terminal. The CDMA spread spectrum is applied to each of the reservation, reply, and traffic channels.

BSPR:
A mobile terminal having a request for data transmission sends a reservation packet at timing synchronized with reference timing on the reservation channel. To specify a transfer channel and transfer timing to be used by each mobile station, the base station transmits a reply packet via the reply channel. Each mobile terminal communicates a data packet at the specified timing via the traffic channel specified by the reply packet.

BSPR:

Additionally, a pilot channel is disposed in the downward direction (from the base station to mobile terminals) to transmit via the pilot channel a pilot signal of which each bit is fixed to "0" or "1". Each mobile terminal continuously keeps synchronization with the pilot signal. Since data packets on each of the downward reply and traffic channels are transmitted in synchronism with the pilot signal, the mobile terminal can despread signals on each of the reply and downward traffic channels in accordance with the timing of pilot signal kept synchronized with the mobile terminal.

BSPR:
The mobile terminal establishes transmission reference timing for the reservation and upward traffic channels according to the pilot signal. The point of timing of arrival at the base station of the reservation and upward traffic packets sent from the mobile terminal in synchronism with the reference timing is delayed relative to the reference timing of the base station for a period of propagation delay due to the distance of upward and downward packet propagation between the mobile terminal and the base station. The base station despreads by a matched filter (MF), which changes a coefficient with the symbol period, the signals spread according to the long code. Consequently, when the timing difference exceeds the one-symbol time between the reception timing of the upward traffic packet and that of the base station due to the propagation delay, the despreading process cannot be normally accomplished, namely, the signals cannot be demodulated.

BSPR:
To solve the problem, a short code is allocated to the reservation channel because it is unnecessary to alter the matched filter coefficient. The base station identifies by the matched filter the signals of a plurality of reservation packets sent from the plural mobile terminals, the packets being overlapped with each other with respect to time. The base station then conducts bit signal processing for each packet and measures the propagation delay time thereof. Using the measured delay time, the reception timing of the upward traffic packet is adjusted with the one-symbol precision to thereby accomplish the despreading process at a high speed for the upward traffic channel to which the long code is allocated.

BSPR:
Furthermore, according to the first and second embodiments of the present invention, the traffic channel receiver of the base station includes a packet de-multiplexer and a mixer. In the configuration, signals which are sent via a multiple channel and which are overlapped in time with each other are detected and are mixed with each other to thereby carry out a RAKE reception. This resultantly improves the probability of acquisition and the signal-to-noise ratio.

DRPR:
FIG. 4 is a block diagram showing the configuration of a base station in the first embodiment of the CDMA mobile communication system according to the present invention;

DRPR:
FIG. 6 is a diagram showing the configuration of a reservation channel receiver of the base station;

DRPR:
FIG. 7 is a diagram showing the configuration of a traffic channel receiver of the base station;

DRPR:
FIG. 14 is a block diagram showing the configuration of a base station in the second embodiment of the CDMA mobile communication system according to the present invention;

DRPR:
FIG. 16 is a block diagram showing another configuration of a traffic channel receiver in the base station of the CDMA mobile communication system according to the present invention; and

DEPR:

Description will be given of the first embodiment by referring to FIG. 1. FIG. 1 is a diagram for explaining the reception timing of an upward traffic packet. According to the present invention, the packet is transmitted in synchronism with a predetermined point of reference timing. The base station continuously transmits pilot signals spread in spectrum according to a PN sequence having an appropriate period on the downward communication line. Each mobile terminal monitors the pilot signals to extract a synchronizing (reference) signal so as to synchronize with a reply signal and a downward traffic signal from the base station. On the other hand, due to the propagation distance, there appears a difference in time between frame timing 102 of the base station and frame timing 103 of the mobile terminal. Therefore, when the base station receives a reservation packet 104 sent from the mobile terminal, there exists propagation delay time .DELTA.t1 associated with the distance.

DEPR:
The base station receives, according to a scheduling algorithm specified by the reply packet 105, an upward or reverse link traffic packet 107 sent from the mobile station. In this operation, according to propagation delay .DELTA.t1 measured at reception of the reservation packet 104, the base station starts receiving the traffic packet 107 when .DELTA.t1 lapses after a reference point of time 106.

DEPR:
FIG. 4 is a diagram showing an example of the configuration of the base station in a CDMA radio communication system to which the present invention is applied. The base station is connected via a network interface 422 to a mobile communication network 423. A packet controller 419 receives a transmission signal 421 from the network interface 422 and then sends a reply signal 513 or a downward (forward link) traffic signal 514 to the pertinent mobile terminal. Moreover, the packet controller 419 receives an upward (reverse link) traffic signal 515 and then sends a received signal 420 to the network interface 422. Additionally, the packet controller 419 obtains a reservation signal 516 on the received reservation channel to schedule data transmission to a terminal having a request for data transmission. The scheduling is accomplished by sending a reply signal to the mobile terminal having transmitted the reservation signal.

DEPR:
The base station sends a pilot signal 512, a reply signal 513, and a downward traffic signal 514. These signals are respectively multiplied by spreading codes (long codes) generated respectively from the PN generators 415, 416, and 471-1 to 471-m, the spreading codes being mutually synchronized with each other. The resultant signals are added to each other by adders. The superimposed signal is then transformed into a signal having a carrier frequency by a high-frequency circuit 403 to be transmitted via a circulator 401 from an antenna 400. Moreover, the PN generator 415 for the pilot signal generates a frame clock signal 408 having a period of the long spreading code.

DEPR:
Conversely, when a signal is inputted from the interface 511, the user interface 510 accordingly outputs a transmission signal 421 to the packet controller 419. The controller 419 then transmits a reservation signal 516 to the base station to notify the request for transmission. A response from the base station is notified by a reply signal 513. Reading the reply signal 513, the packet controller 419 transmits, according to a scheduling algorithm indicated by the base station, an upward traffic signal 515 including a packet of the transmission signal 421. The pilot signal 512 is continuously transmitted from the base station. A delay lock loop (DLL) controller 507 keeps synchronization according to the pilot signal. The DLL controller generates a system clock signal 506 to be inputted to the respective PN generators (only the PN generator 415 is shown in FIG. 5). The system clock 506 is equivalent to the chip clock in the base station and is used to establish synchronization between operations respectively of the base station and the mobile terminal. The PN generator (long code) 415 for despreading the pilot signal generates a frame clock signal 509 having a period of the long code. The frame clock 509 is fed to the reset terminal of each PN generator to synchronize PN generators (long code) 416, 417, 504, and 505 with each other. The upward or reverse link traffic signal 515 is multiplied by a multiplier by a spreading code (long code) generated from the PN generator 504, i.e., a spectrum spreading process is carried out for the signal 515. The reservation signal 516 is multiplied by a multiplier by a spreading code (long code) generated from the

PN generator 505, i.e., a spectrum spreading process is carried out for the signal 516. The upward traffic signal and the reservation signal having the spreading process are then added by an adder to each other to be transmitted via a high-frequency circuit 404 and a circulator 401 from an antenna 400.

DEPR:
FIGS. 13 to 15 shows the second embodiment according to the present invention. FIG. 13 is a diagram for explaining the reception timing of the upward or reverse link traffic packet in the second embodiment. In this embodiment, the base station starts the despreading process at a point of timing when a predetermined maximum delay .alpha.tmax lapses after the reference point of timing. At reception of a reservation packet, the base station measures delay time .DELTA.t2 and subtracts the delay time from the maximum delay time .DELTA.tmax to produce a delay control signal representing the resultant value, i.e., .DELTA.tmax-.DELTA.t2. The control signal is notified to the mobile terminal by the reply packet 105'. The mobile terminal decodes the delay control signal in the reply packet to transmit an upward traffic packet when the time (.DELTA.tmax-.DELTA.t2) indicated by the delay control signal lapses after the reference point of timing. Thanks to the correction of delay by the mobile terminal, the base station can initiates receiving the upward traffic packet 107 at timing delayed .DELTA.tmax relative to the reference timing.

DEPR:
FIG. 14 shows the configuration of the base station in the second embodiment. In the embodiment, the delay time information 407 measured according to the reservation packet is passed to the mobile terminal by the reply signal 513. On the basis of the delay time information 407, the mobile terminal corrects the propagation delay to send data with the corrected delay via the upward traffic channel. In FIG. 14, the same circuit constituent elements as those of FIG. 4 are assigned with the same reference numerals and achieve the same functions as those of FIG. 4.

DEPR:
In the second embodiment, the delay time information 407 measured by the reservation channel receiver 405 is subtracted from the maximum delay time 450 to attain the delay control signal 451. The signal 451 is mixed with a reply signal 513 by a mixer 452 to be transmitted to the mobile terminal. When the upward traffic packet sent from the mobile terminal with a delay time corresponding to the delay control signal 451 is received by the base station, the propagation delay of the packet is virtually equal to the maximum delay time 450. After a lapse of the maximum delay time 450, a PN selector 702 of each of the traffic channel receivers 409-1 to 409-m initiates its operation.

WEST

Generate Collection

L10: Entry 1 of 2 File: USPT Jun 24, 1997

DOCUMENT-IDENTIFIER: US 5642348 A
TITLE: Access director interface for narrowband/broadband information distribution network

BSPR:
In a particular embodiment CDMA modulation techniques are utilized for signals being supplied from an antenna for distribution and repeated by the access director as the same CDMA modulated signal within customer premises for wireless access. Wireless communicators may receive the same CDMA signal from the access director and also from the antenna or microport of the overall distribution system without any conversion of operation of the wireless communicator being required. This utilizes the CDMA modulation ability to minimize multipath interference and allows the wireless communicator to select transmissions from either the access director or microport source based on the quality/power of the received signal.

DEPR:
The access director 101 is connected by wiring both copper and cable to a variety of customer equipment devices including a stereo interface 207, a video interface 208 and a wired telephone 209. In addition to the wired devices the access director 101 communicates through a wireless repeater circuit with a CDMA modulated signal to a personal wireless communicator 205 within the house. The microport distribution node also communicates with an identical CDMA modulated signal to a personal wireless communicator 206 situated to communicate directly microport node 201.

DEPR:
A block diagram of the access director as shown in the schematic of FIG. 4 includes a high gain directive array antenna 402 for facilitating wireless communication between a microport antenna of the communication network and the access director. Incoming and outgoing RF signals are processed by a duplex (power separation) filter 403 which allows the access director to use the antenna for both reception and transmission of RF signals. The downlink connection of the duplex filter 403 is connected to a low noise amplifier (LNA) 504. An output of the LNA 404 is connected to a splitter circuit 419 which directs half the received RF power comprising downlink CDMA signals to a filter circuit 444, a subsequent RF buffer amplifier 443 and a subsequent filter 442 tuned to downlink CDMA receive frequencies. Filter 442 is connected to an omnidirectional antenna 441 for communication with local wireless communication units omnidirectional antenna 441 is carefully physically situated in the null of the omnidirectional antenna pattern to minimize any interference from the microport antenna and the high gain directive array antenna 402.

DEPR:
The omnidirectional antenna reradiates the CDMA signal received at the directive array antenna 402 to the local mobile communicator units within its range. The gain provided by the directional array antenna and the LNA 404 enables the radiated CDMA signal to be an accurate phase delayed version of the RF signal radiated by the microport antenna. The composite microport and access director signals appear as a single signal with multipath arrivals one of which is strong due to proximity to the microport or access director. The most appropriate personal communicator receiver, for this application, is a RAKE receiver. The RAKE receiver is one particularly suited for operating in a multipath signal arrival and fading environment. Details of the design of such RAKE receivers are well known in the art and are not a part of this application. An advantage of the RAKE receiver and associated communications is the significant reduction of power requirements which in the case of needed power reduces the drain of any batteries in the system.

DEPR:
The output of the LNA 404 is also connected via the splitter 419 to a downlink filter 406 and to the mixer 426 which has the frequency of the local oscillator or frequency synthesizer 410 input applied thereto to generate a signal having a frequency suitable for coaxial cable distribution. The mixer output is filtered in filter 407 and the output amplified by a buffer amplifier 414. The output of the amplifier 414 is applied to a signal splitter 416 and a portion of the signal is applied to a coax interface 430. The signal is amplified by a coaxial driver amplifier 434 and filtered by a filter 433 and applied to a coax cable 435 which may be connected to a local digital video decoder, a high speed computer interface, cable stereo equipment or other applications requiring high bandwidth signals. CDMA downlink signals may be coupled to the coax to permit ISDN D channel packets to communicate with a set-top box of the video or stereo.

DEPR:
The splitter 416 in addition supplies an RF signal to a wireless ISDN to wired telephone converter 450. The converter includes a transceiver for the CDMA uplink and downlink channels including a second mixer/IF 453 for downlink signals and a mixer/transmit amplifier 456 for uplink signals. Both units are connected to a frequency synthesizer 454 for supplying a local oscillator frequency. The demodulator 452 and the modulator 455 are designed for wideband CDMA signals and the demodulator is implemented using a RAKE structure and a means for generating a CDMA signal from baseband digital information.

DEPR:
The bit timing for the data stream is derived from a timing reference that is transmitted over the radio link in the downlink direction via the pilot and synchronization channels. When the traffic channel is established the ISDN frame timing produced by the NT and TE emulators is itself synchronized via buffers controlled by the wireless ISDN processors in the microport and access director.

DEPR:
The ISDN phone must be synchronized with the system since it is not an asynchronous device. A synchronizing signal, is continuously transmitted by the CDMA channel from the network to time synchronize with the CDMA system to time synchronize with the CDMA system. This is sent from the network to the customer premises circuitry. This is followed by signaling over the access channel and subsequent set up of the traffic channel. The emulation data stream is used during the idle period to sustain the illusion of a wired connection.

DEPR:
The processing of the S-interface NT emulator, in the access director, is shown in FIG. 6. The emulator provides a surrogate circulating data stream normally present in a wired system. The process shown in FIG. 6A begins in the terminal 601 which initializes the ISDN chip of the receiving system to adapt to a simulated network terminal (NT) mode. Following acquisition of the pilot and synchronization wireless CDMA or ISDN channels the recovered timing reference initializes the bit clock of the ISDN chip. Following this its buffers are initialized to contain the serial I/O data as SIO-1 and SIO-2 representing data streams normally appearing between the network emulator and ISDN phone and between the network termination NT and the terminal end TE over the traffic channel. The DSP is initialized from the ISDN chip buffer with interrupts representing the SIO-1 and SIO-2 data in response to interrupts supplied by the ISDN chip. The flow of FIG. 6A then waits for interrupts. The interrupt for an SIO-1 input to the ISDN phone is shown in the FIG. 6B where the interrupt appears at the terminal 611. The data is received from the ISDN switch in block 612 and the data is input into the DSP in block 613. The C channel of the C data block is replaced by all Zeros to form the desired data queue in block 614 and the return terminal 615 is reached.

DEPR:
A mobile ISDN terminal also requires a separate independent emulator. A block diagram of a wireless interface between a customer premises and ISDN terminals is shown in the FIG, 7. The terminal end of the system network ends in a network termination 701 which provides the terminal equipment emulation to the network. A wireless CDMA coder and transceiver 702 is interactively connected to the network termination and radiates to and receives from the customer premises CDMA encoded signals.

DEPR:
A CDMA terminal 703 at the customer premises is connected by a switch "S" to the terminal end ISDN terminal 704 and in a functional way via connection 705. NT emulation is provided by the terminal end circuitry.

DEPR:
The call set-up procedures are shown in the FIGS. 9 and 10. Call set for outgoing call from the customer premises, as shown in FIG. 9, begins with call processing 901 in response to the initiating action of the caller. This is transmitted to the call control 902 at the wireless transmitter located at the customer premises. The call control 902 initially sends a set up message to a call processing unit 905 of the network. It also sends a request to the CAI (CDMA air interface) call processing unit 902 which establishes the forward and reverse traffic channels to communicate with the CAI call processing 906 located at the base station connected to the network. The call processing units 903 and 905.

DEPR:
The processing state sequence of the wireless CDMA air interface is illustrated in the FIG. 11. The initial state 1101 at power start up is followed after a successful self test by a terminal initialization state 1102, at which the fixed terminal fully acquires the system and is set up to process calls. FIG. 12 below details three subtasks of this initialization state. At the conclusion of the initialization state the wireless ISDN processor transmits to the NT a timing reference which is used to establish ISDN bit timing.

DEPR:
The initialization state sub processes are shown in the FIG. 12. Upon power up the state 1201 acquires a pilot channel on a selected CDMA frequency assignment. The following state 1202 acquires a sync channel to the CDMA base station and synchronizes the TE to the ISDN network. In state 1203 the paging channel is acquired and the terminal can enter the idle state.

DEPR:
The various channels and function in a wireless CDMA system between the network's microport and the customer premises access director are shown in the FIG. 13. The pilot performs chip synchronization for the wideband CDMA that is being used. The sync channel carries some system information and allows frame synchronization to occur. The paging channel is a low bandwidth channel that notifies a customer of an arriving call. The access channel performs call origination. The traffic channels are user voice channels.

CLPV:
an access director for providing a wireless interface with a CDMA signal format between the termination/origination equipment and the wireless microport including:

CLPW:
the radio signal processing circuitry, connected to receive down link signals from the duplex filter, including receiving circuitry for processing down link signals having first input IF circuit for amplification, modulation and frequency modification of incoming signals to generate at least a local wireless ISDN signal having the CDMA signal format for local area service via a local antenna, a wide band signal for coaxial distribution and a second IF circuit for processing a narrowband signal for wired ISDN and tip/ting down link distribution;

CLPW:
CDMA processing equipment to supply CDMA signals to wireless units of the customer at the same bandwidth and frequency as that transmitted by the network; and

CLPW:
the RF circuitry for receiving and transmitting CDMA signals for transmission including an omni antenna.

CLPX:
RF circuitry for receiving and rebroadcasting wireless downlink CDMA signals;

CLPX:

RF circuitry for receiving and transmitting CDMA signal for transmission to the telecommunication network;